CORE
Metadata, citation and similar papers at core.ac.uk
Provided by SJSU ScholarWorks

San Jose State University
SJSU ScholarWorks

ART 108: Introduction to Games Studies | Art and Art History & Design Departments

Fall 12-2017

Random Numbers and Gaming

Sinjin Baglin
San Jose State University, sinjinmikal10@gmail.com

Follow this and additional works at: http://scholarworks.sjsu.edu/art108


Part of the Computer Sciences Commons, and the Game Design Commons

Recommended Citation
Sinjin Baglin. "Random Numbers and Gaming" *ART 108: Introduction to Games Studies* (2017).

This Final Class Paper is brought to you for free and open access by the Art and Art History & Design Departments at SJSU ScholarWorks. It has been accepted for inclusion in ART 108: Introduction to Games Studies by an authorized administrator of SJSU ScholarWorks. For more information, please contact scholarworks@sjsu.edu.

Sinjin Baglin

James Morgan

Introduction to Game Studies

25 November 2017

Random Numbers and Gaming

How can a game that's focused on shooting someone else before they shoot you be complex? Well *in Counter Strike: Global Offensive* there is a lot underneath the simple idea of shooting a weapon that goes on. For one the model must be drawn and have an accurate line between the model and crosshair drawn on the center of the screen. The gun must have animation when its shot. The user interface must update the number of bullets spent as well as displaying the map, player health, and player kill feed. Then after all that the bullets must come out, but how? The guns in *Counter Strike: Global Offensive* have something very distinguishable, a set pattern of how the bullets come out, a spray pattern. This means that the guns can be controlled in a set matter every time. In *Counter Strike: Global Offensive* spray pattern control becomes a muscle memory to a player after long periods of playing. It's a design choice that makes the gunplay between players more about instant crosshair placement with the faster player usually winning. This is very different from the gunplay of the current popular shooter *Player Unknown's Battlegrounds*. *Player Unknown's Battlegrounds* implements a similar user interface choice for the players, but the gunplay is fundamentally different. *Player Unknown's Battleground's* spray pattern for the guns are random. Random means the bullets come out of the player's guns, sporadically, in different places then what the crosshair indicates. So how does this affect the player experience? Well as opposed to *Counter Strike: Global Offensive*, the design choice makes gunplay between to players more about how a person can

adapt faster when encountering another. With the player who adapts faster the usual victor, not counting the various other variables that Pla*yer Unknown's Battlegrounds* introduces to the player. So why does the change from a set pattern to random make for such a different experience in gameplay. Did the usage of randomness make for such a different experience? Yes, it does. Random numbers in video games are utilized frequently and have been used for a long time, whether it was better for the player experience is often hard to tell. So just what is this "randomness"? What games use random numbers and why? Are random numbers a bad practice? The usage of random numbers in games is nothing new, but poor implementations and bad business practices have given random numbers a smudge mark on their reputation.

The creation of random numbers is hard to grasp as it is difficult to grasp how it is possible to recreate the phenomena that is random. Random can be defined as "made, done, happening, or chosen without method or conscious decision" (Google Search). So, it is hard to visualize how someone can replicate this concept in a video game. There are two ways randomness can be replicated computationally, one is through a True Random Number Generator (TRNGs). TRNGs "extract randomness from physical phenomena and introduce it into a computer" (Haahr). This means that the randomness observed from something in the real world is used to calculate the random numbers used in the video game. According to Haahr good sources to observe randomness for TRNGs are phenomena like radioactive decay or atmospheric noise (Haahr). Haahr also states TRNGs are often considered inefficient to utilize as they take more time to compute and are nondeterministic (Haahr). TRNGs being nondeterministic means that the computation cannot be recreated other than the computation being recreated through chance. Another way to compute random numbers is through Pseudo-Random Number

Generators (PRNGs). Haahr describes the difference between PRNGs vs TRNGs as the following:

> The basic difference between PRNGs and TRNGs is easy to understand if you compare computer-generated random numbers to rolls of a die. Because PRNGs generate random numbers by using mathematical formulae or precalculated lists, using one corresponds to someone rolling a die many times and writing down the results. Whenever you ask for a die roll, you get the next on the list. Effectively, the numbers appear random, but they are really predetermined. TRNGs work by getting a computer to actually roll the die — or, more commonly, use some other physical phenomenon that is easier to connect to a computer than a die is. (Haahr)

By making PRNGs generated artificially PRNGs solve the problem of efficiency that TRNGs have. Computed random numbers no longer need some form of external observable output to create the phenomena of randomness. PRNGs are particularly important to games, because almost random numbers in games are created using PRNGs.

Random numbers exist in all sorts of games, but exactly what elements do random numbers govern? The answer, there is just too many! Let's start off by revisiting a game discussed earlier, *Player Unknown's Battlegrounds*. *Player Unknown's Battleground's* uses random numbers many ways, but for this game we will discuss something that is shared by games across multiple genres, the "Loot Table". According to Byer, "A loot table both determines the probability and attributes of an item and is an important concept both for regular ARPG game design and understanding how game mechanics and systems work" (Byer, "Defining Loot Tables in ARPG Game Design"). Notice how Byer is specifically talking about loot tables regarding Action Role-playing games. Well Player Unknown's Battlegrounds also

uses this system. *Player Unknown's Battleground* uses a loot table to determine which weapon or item drops at a given location on the map. Since it utilizes a loot table that means each spot where an item can potentially spawn, the loot table determines both the probability of that item appearing there and the attribute associated with that item. The game utilizes a loot table to keep each game fresh as a player's loadout will always very from game to game. One game a player could be a sniper, another a rifleman, or you could be the gunslinger of all time and win with a pistol. *Player Unknown's Battleground* shares the implementation of loot tables with other games such as: *Final Fantasy*, *Diablo,* and *World of Warcraft*. Those games all use a similar loot table system. Another usage of random numbers is determining when a critical hit occurs. According to the Dungeon and Dragons glossary a critical hit is a "hit that strikes a vital area and therefore deals double damage or more" (D&D Glossary Main Page). Essentially critical hits are supposed to emulate when a player hits an instantly lethal area of a person thus inflicting more damage. For example, in *Fallout: New Vegas* a background PRNG constantly governs the success of whether a player will critically hit another character. While still random the player has some sort way to influence a critical hit. In this case by raising your luck stat you can increase the chance that the PRNG will generate a result in your favor. Many Role-playing games share this mechanic, both the idea of a critical hit and the player's ability to influence how often it occurs. Some of these games include: *Final Fantasy, Earthbound,* and *Pokémon.* Additionally, it is also only possible to do with PRNGs as you can modify the computations. Random numbers can also be used for the generation of maps. For example, in the game Spelunky the map generated by random numbers as it decides the entire layout of the map. Randomized map layouts are interesting because they give the game more room to provide a player a different

experience. Some more games that utilize randomized map layouts include *Persona 3/4*, *Minecraft,* and *Recettear: An Item Shop's Tale*.

Recently there has been a new type of game that has been popular in the east that heavily uses random numbers, the "Gacha Game". According to Famularo, a gacha game is a game in which "in which players gain the opportunity to roll for new, exclusive characters using currency that they can earn in-game (albeit slowly) or through paying real cash for in-game currency to allow for somewhat instant gratification" (Famularo). Gacha games are modeled off the Japanese gachapon machines, machines where collectable items (figurines or stickers usually) were put into machines and a buyer has the chance to receive potentially rare items. This model has now been applied to video games, which means random numbers are used instead of machines to determine the potentially rare items a player might receive. As Famularo said above, gacha games let a player essentially attempt to roll for exclusive characters (as well as items) in game. If a player is lucky enough the game will give them the character or item, but otherwise the player is out of luck. The act of rolling the gacha becomes a part of the game itself, as in a way it is like gambling and appeals to the same crowd. This type of way to model a game has been so successful that it has earned itself its own genre, hence the name "Gacha game". An example of a gacha game is the recently released *Fire Emblem: Heroes*, where various characters from the franchise team up with the player and to acquire new characters of rare quality they must roll the gacha. Some more examples of gacha games are: *Fate/Grand Order*, *Puzzles and Dragons*, and *Granblue Fantasy*.

Random numbers in games have existed forever, but recently games have been misusing them. Gacha games are one example. Gacha games are interesting because they are so new, it's a type of game that will probably only continue to evolve with time. However, gacha games abuse

the usage of random numbers. Not only do company owners profit massively from gacha games, they control the algorithms that manipulate the random numbers that let players acquire characters. This means that companies can incentivize players to spend more money. The usage of random numbers here is almost equivalent to gambling. Japan itself has already had to regulate the gacha game industry, specifically the kompu gacha, as before the regulation of the industry many considered it gambling (Shibuya et al.). Gacha games also have the problem that gameplay enjoyment is often tied to the gacha system. Gacha games rare items/characters often make a huge impact on the play of the game. Some items can make the games trivial even making the game almost pay-to-win. For example, in Granblue Fantasy you can choose between multiple elements (Playstyles), but two of these elements are completely unviable unless you have the special gacha character that makes the element bearable to even play. Another abuse case of random numbers today is something like gacha games, "Loot Boxes". Like gacha games, a loot box is something that provides randomly an in-game item/character to a player. What differentiates the two is that a loot box is always consistent with what it will provide a player while a gacha system is not. Loot boxes just like gacha games are potentially subject to abuse. For example, recently Electronic Art's released a game called *Star War's Battlefront 2* which had a major scandal. The game was going to implement a loot box system that would give players the "abilities to do more damage or move faster**,** or you might get a dud, like a "dance" emote for your character" (Park). So not only was the system pay-to-win, it was almost like gambling or like a gacha. Clearly the only purpose of the loot box was to allow the company to make more money off the select few who would pay for these microtransactions. Fortunately, the community backlash was so great Electronic Arts had to pull back the introduction of loot boxes. Another problem with random numbers today are the loot tables. Loot tables are not fun. In most

games they are implemented in, loot tables impede player progress or are outright broken. Loot tables are a design choice that feels dated. It encourages a grindy experience for the player that creates a lot of downtime and monotonous work. For example, in the Massive Multiplayer online game *Dungeon Fighter Online* the progress of your character is totally determined by loot tables. The loot tables for this game are so unfair to the player that without constant playing it's impossible to progress. At a certain point, any game will become trivial to the player if all they are doing is trying to proceed to the next step. l As Reggie Fils-Aime says "If it's not fun, why bother?". It really does feel like this design choice needs a modernization.

Random numbers in gaming will continued to be utilized in games for many years to come. Pseudo-random numbers will continue to be the driving force behind generating game's random numbers. Their usage has allowed for the implementation of loot tables, critical hits, map generation and much more that is not listed here. Random numbers have even helped build an entirely new type of game, where the usage of random numbers is a core aspect, the gacha game. However, like all tools used build great things it is subject to abuse particularly by companies looking to profit and design choices that don't encourage a fun experience. This doesn't mean the future is bleak at all for random numbers in gaming as all these problems can be fixed with more awareness to the growing problem. The usage of random numbers has contributed too much to gaming to simply be thrown out due to being abused of recent time.

Works Cited

Byer, Josh. “Defining Loot Tables in ARPG Game Design.” *Game Wisdom*, 14 Oct. 2014, game-wisdom.com/critical/loot-tables-game-design

Byer, Josh. “The Addictive Pulls of Gacha Design.” *Gamasutra Article*, 28 Sept. 2017, www.gamasutra.com/blogs/JoshBycer/20170928/306639/The_Addictive_Pulls_of_Gacha_Design.php.

D&D Glossary Main Page, archive.wizards.com/default.asp?x=dnd%2Fglossary&term=Glossary_dnd_criticalhit&alpha=C.

Google Search. Google. 30 May 2013. Web. 26 November 2017.

Famularo, Jessica. “'Fire Emblem Heroes' Is a Gacha Game.” *Inverse*, 2 Feb. 2017, www.inverse.com/article/27267-what-are-gacha-games-fire-emblem-heroes.

Haahr, Mads. “True Random Number Service.” *RANDOM.ORG - Introduction to Randomness and Random Numbers*, www.random.org/randomness/. 26 November 2017.

Park, Gene. “How a Star Wars video game faced charges that it was promoting gambling.” *The Washington Post*, WP Company, 18 Nov. 2017, www.washingtonpost.com/news/comic-riffs/wp/2017/11/18/how-a-star-wars-video-game-faced-charges-that-it-was-promoting-gambling/?utm_term=.899631fb1898.

Shibuya, Akiko, Mizuha Teramoto, and Akiyo Shoun. "Systematic Analysis of In-Game Purchases and Social Features of Mobile Social Games in Japan." *DiGRA Conference*. 2015.